

**METHODS AND COMPOSITIONS FOR DETECTING NUCLEIC ACIDS USING  
SCANNING PROBE MICROSCOPY AND NANOCODES**

**ABSTRACT OF THE DISCLOSURE**

A method for determining a nucleotide sequence of a nucleic acid is provided that includes contacting the nucleic acid with a series of labeled oligonucleotides for binding to the nucleic acid, wherein each labeled oligonucleotide includes a known nucleotide sequence and a molecular nanocode. The nanocode of an isolated labeled oligonucleotides that binds to the nucleic acid is then detected using SPM. Nanocodes of the present invention in certain aspects include detectable features beyond the arrangement of tags that encode information about the barcoded object, which assist in detecting the tags that encode information about the barcoded object. The detectable features include structures of a nanocode or associated with a nanocode, referred to herein as detectable feature tags, for error checking/error-correction, encryption, and data reduction/compression.